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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/458,123

12/08/1999

BLAINE R. SPADY

M-7677-US

8470

34036

7590

07/12/2004

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EXAMINER

STOCK JR, GORDON J

ART UNIT

PAPER NUMBER

2877

DATE MAILED: 07/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/458,123

**Applicant(s)**

SPADY ET AL.

**Examiner**

Gordon J Stock

**Art Unit**

2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 5/5/04;6/10/03.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9;15-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-9, 15-22 and 24 is/are rejected.
- 7) ☒ Claim(s) 5 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 1999 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. The Examiner finds applicant's arguments of May 5, 2004 in regards to the election/restriction of February 11, 2004 persuasive. Therefore, the Examiner has withdrawn the restriction requirement; subsequently, the Examiner has withdrawn the finality of the action of February 11, 2004, due to the withdrawal of the restriction in order to treat all subsequent claims 1-9 and 15-24. A non-final rejection action follows.

### ***Drawings and Specification***

2. The drawings and specification are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description:  $r$  and  $\theta_M$  of Fig. 1 (in the disclosure there is reference to an 'R'). In addition, Figs. 3 and 4 have the following minor objections: in both figures: "Rotary Stage" should read --Rotary Stage--. Corrected drawing sheets, or amendment to the specification to add the reference character(s) in the description, are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1, 6, 9, 15, 16, 17, 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sullivan et al. (6,414,752)** and further in view of **Uritsky et al. (5,381,004)** and **Poultney et al. (5,474,647)**.

As to **claims 1, 6, 9, 15, 16, 17, 19**, Maeda in a wafer inspection apparatus discloses the following: positioning a wafer at a station; whereas, the system suggests alignment and positioning of the optical system relative to the wafer for the optical system is above the wafer to be inspected and images from the wafer are received by the imaging sensors; a plurality of areas of the wafer are investigated (Figs. 1, 30, 31; col. 6, lines 50-67; col. 7, lines 1-20; col. 9, lines 55-67; col. 10, lines 1-35; col. 31, lines 10-65); also there is a movement mechanism (19 of Fig. 1) suggesting the optical system may be moved laterally and rotationally relative the wafer; film thickness of layers may be determined for dimensions of patterned areas may be derived (col. 1, lines 10-20).

As for being a fixed station: again, Maeda suggests that the wafer may be stationary while the optical system is moved (19 of Fig. 1). In addition, Sullivan in an inspection device teaches the equivalence between a fixed wafer and moving optical system versus a moving wafer and fixed optical system (col. 4, lines 10-20). Therefore, it would be obvious to one skilled in the art to have a fixed station for the wafer and a moving optical system with lateral and

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rotational movement for wafer inspection, for the system is functionally equivalent to a moving wafer and fixed optical system. As for alignment with edge detection and an alignment feature such as a notch, Maeda suggests that preliminary alignment has been performed between the wafer and optical system for the imaging sensors are capable of imaging patterns on the object being inspected (Figs. 1, 30, 31). Uritsky in a wafer inspection system teaches prealignment of the wafer with using edge detection and a notch to prepare the system for wafer inspection (col. 5, liens 60-67; col. 6, lines 1-20); whereas, the rotational axis and linear axis of the wafer versus the optical system's rotational and linear translation are used in defining a wafer's coordinate for inspection (col. 10, lines 2-15). Also Poultney in a wafer metrology system teaches prealignment of a system using a wafer's notch for orientation (col. 4, lines 50-67; col. 5, lines 1-5). Therefore, it would be obvious to one skilled in the art at the time the invention was made to have prealignment using edge detection and a notch in order to have preliminary orientation of the wafer prior to inspection with the imaging system.

Again, Uritsky states that there is a relationship between an optical system's linear and rotational movements and a wafer's coordinate system. In view of Sullivan the objective lens of Maeda (9 of Fig. 1) would move rotationally with an axis not through the objective lens in order to view differing portions of the wafer (in regards to **claims 6 and 19**).

5. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sullivan et al. (6,414,752)** and further in view of **Uritsky et al. (5,381,004)** and **Poultney et al. (5,474,647)** further in view of **Meeks et al. (2004/0046959)** and **Elliott et al. (5,669,979)**.

As for **claim 2**, Maeda in view of the others disclose everything as above (see **claim 1** above). However, they are silent concerning using a window and being in a processing environ. Meeks in an inspection apparatus teaches having the system inspect while the wafer is processed (paragraph 0157) and Elliott teaches inspecting a wafer while being processed with a window (Fig. 5: 430). Therefore, it would be obvious to one skilled in the art to have the system within a processing apparatus and to use a window in order to inspect wafers while they are being processed.

6. **Claims 3-4, 18** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sullivan et al. (6,414,752)** and further in view of **Uritsky et al. (5,381,004)** and **Poultney et al. (5,474,647)** and further in view of **Sandland et al. (4,556,317)**.

As for **claims 3-4 and 18**, Maeda in view of the others disclose everything as above (see **claims 1 and 15** above). They do not suggest rotating the images obtained. However, Sandland in a wafer inspection system teaches rotating images to correct for inspection changes (col. 16, lines 10-40). Therefore, it would be obvious to one skilled in the art to have the system have image correlation by rotating images to correct for inspection changes as the wafer is imaged at different locations on its surface.

7. **Claims 7 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sullivan et al. (6,414,752)** and further in view of **Uritsky et al. (5,381,004)** and **Poultney et al. (5,474,647)** and further in view of **Cheng (5,546,179)**.

As for **claims 7 and 20**, Maeda in view of the others disclose everything as above (see **claims 1 and 15** above). They are silent concerning measuring reflectance and viewing a drop in intensity to denote an edge or alignment feature. However, Cheng in an inspection device

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teaches that reflectance and a drop in intensity is used to detect an edge or notch (Figs. 5, 5a, 5b). Therefore, it would be obvious to one skilled in the art that the method comprised utilizing reflectance and a drop in intensity to detect an edge or notch for edges and notches of wafers are detected through reflectance intensities.

8. **Claim 8** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sullivan et al. (6,414,752)** and further in view of **Uritsky et al. (5,381,004)** and **Poultney et al. (5,474,647)** and further in view of **Tsujimoto et al. (6,238,515)**.

As for **claim 8**, Maeda in view of the others disclose everything as above (see **claim 1** above). In addition, the edge detector (Fig. 1: 21) suggests an image recognizer. Tsujimoto teaches using an image recognition unit in order to position a wafer (col. 7, lines 5-15). Therefore, it would be obvious to one skilled in the art that the system comprised an image recognition unit in order to recognize the wafer for positioning.

9. **Claims 21 and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sandland et al. (4,556,317)**.

As for **claims 21 and 22**, Maeda in an inspection apparatus discloses the following: providing lateral and rotational movement of the wafer in respect with the optical system, an x,y,z, and theta stage; imaging at least one area of the wafer (Figs. 1, 30, 31; col. 6, lines 50-67; col. 7, lines 1-20; col. 9, lines 55-67; col. 10, lines 1-35; col. 31, lines 10-65). He is silent concerning rotating the image. However, Sandland in a wafer inspection system teaches rotating images to correct for inspection changes (col. 16, lines 10-40). Therefore, it would be obvious to one skilled in the art to have the system have image correlation by rotating images to correct for inspection changes as the wafer is imaged at different locations on its surface.

10. **Claim 24** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Maeda et al. (6,263,099)** in view of **Sandland et al. (4,556,317)** in view of **Sullivan et al. (6,414,752)**.

As for **claim 24**, Maeda in view of Sandland discloses everything as above (see claim 21 above). Maeda does not suggest an objective lens movement though the optical system has a movement mechanism (Fig. 1: 19 and 39). However, Sullivan in an inspection device teaches the equivalence between a fixed wafer and moving optical system versus a moving wafer and fixed optical system (col. 4, lines 10-20). Therefore, it would be obvious to one skilled in the art to have a fixed station for the wafer and a moving optical system encompassing the objective lens with lateral and rotational movement for wafer inspection, for the system is functionally equivalent to a moving wafer and fixed optical system. In view of Sullivan and Sandland the objective lens of Maeda (9 of Fig. 1) would move rotationally with an axis not through the objective lens in order to view differing portions of the wafer.

***Allowable Subject Matter***

11. **Claims 5 and 23** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to **claims 5 and 23**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for inspecting a wafer changing a rotation angle of the image while moving the optical system, wherein the changing is such that orientation of features in the image remain constant as the optical system moves, in combination with the rest of the limitations of **claims 5 and 23** respectively.



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***Response to Arguments***

12. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

***Fax/Telephone Numbers***

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

- 1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and
- 2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

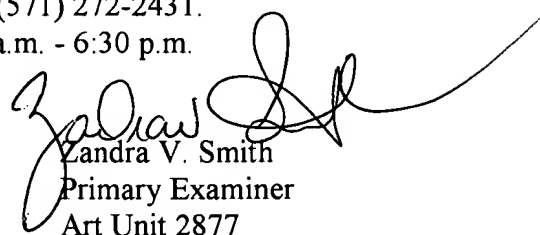
*Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: (703) 872-9306*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431. The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.



gs

July 7, 2004

  
Zandra V. Smith  
Primary Examiner  
Art Unit 2877